Diploma Programme
Programme du diplôme
Programa del Diploma

Sports, exercise and health science
Higher level
Paper 2

26 October 2023

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

Candidate session number

2 hours 15 minutes

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer two questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.

8823 – 6602

Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

1. A study investigated the performance of cyclists in VO_2max and peak power tests after performing high-intensity interval training (HIIT) for four weeks. One group completed the training while wearing an elevation mask (EM). A different control group completed the same training without the use of a mask. EMs are designed to simulate oxygen levels that would be experienced at higher altitudes. Results (mean and standard deviation) pre- and post-training for the tests are shown in **Figure 1**.

Figure 1: (a) VO_2max, (b) peak power, and (c) average power for individual tests

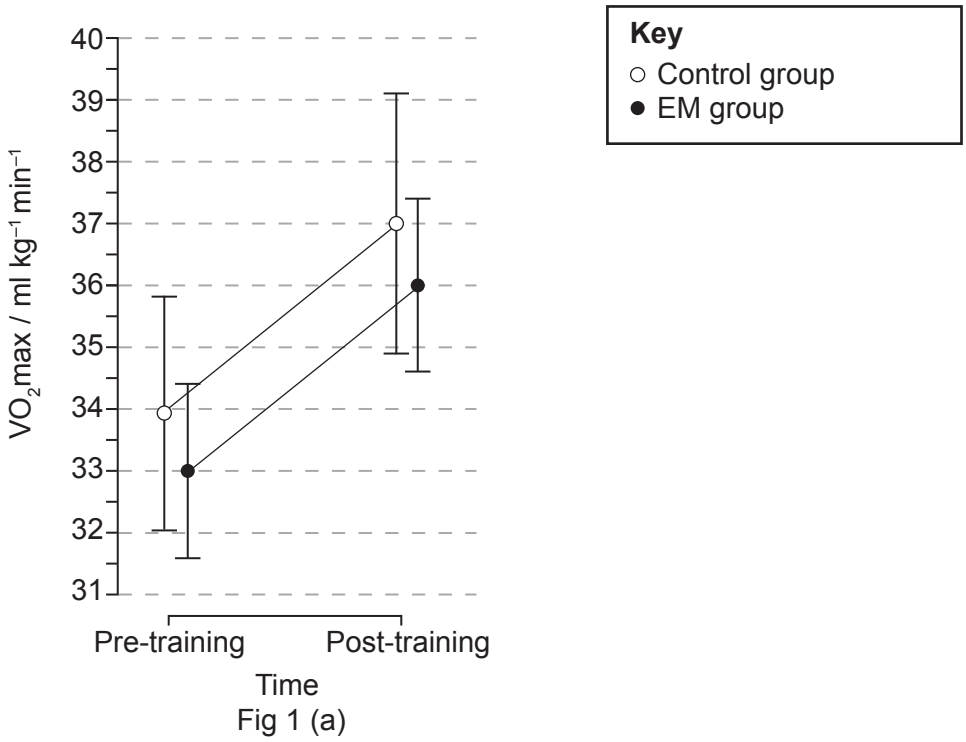

Fig 1 (a)

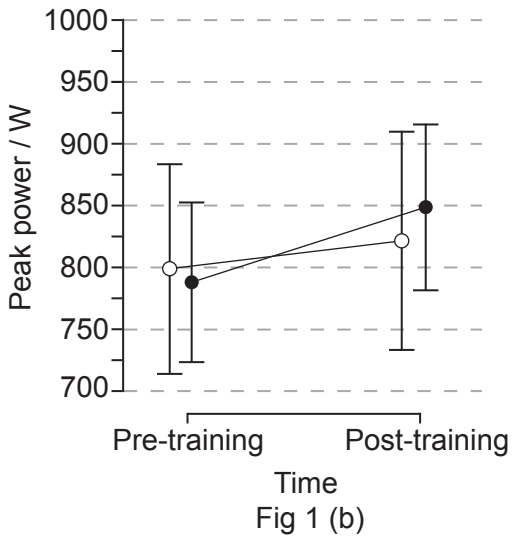

Fig 1 (b)

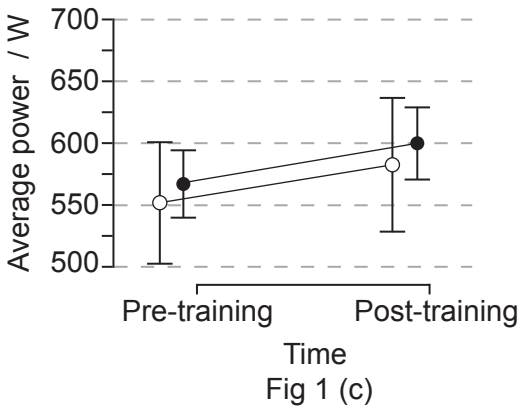

Fig 1 (c)

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(Question 1 continued)

(a) State the peak power, in W, for the EM group post-training. [1]

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(b) Calculate the mean change in VO_2max, in $ml\,kg^{-1}\,min^{-1}$, for the EM group from pre-training to post-training. [1]

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(c) The coefficient of variation is the ratio of the standard deviation to the mean expressed as a percentage. Compare and contrast the coefficients of variation of the data represented in **Figure 1**. [2]

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(d) With reference to **Figure 1(b)** and **Figure 1(c)**, compare and contrast the reliability of the results for the peak power and average power data. [2]

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(Question 1 continued)

(e) Deduce the effect of wearing an EM on the cyclists' performance in the tests. [3]

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(f) (i) State why randomization was used to assign participants to the EM and control groups. [1]

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(ii) Outline the importance of using control groups to compare data before and after intervention. [2]

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2. (a) State the role of the immune system in maintaining the health of an athlete. [1]

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(b) An elite endurance athlete has planned a high volume of intense training during a cold winter. Outline **two** of the athlete's immune responses to this prolonged period of training. [2]

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3. An 18-year-old female is training for a 10 km race.

(a) Outline **one** role of the brain stem and **one** role of the diencephalon during a training session. [2]

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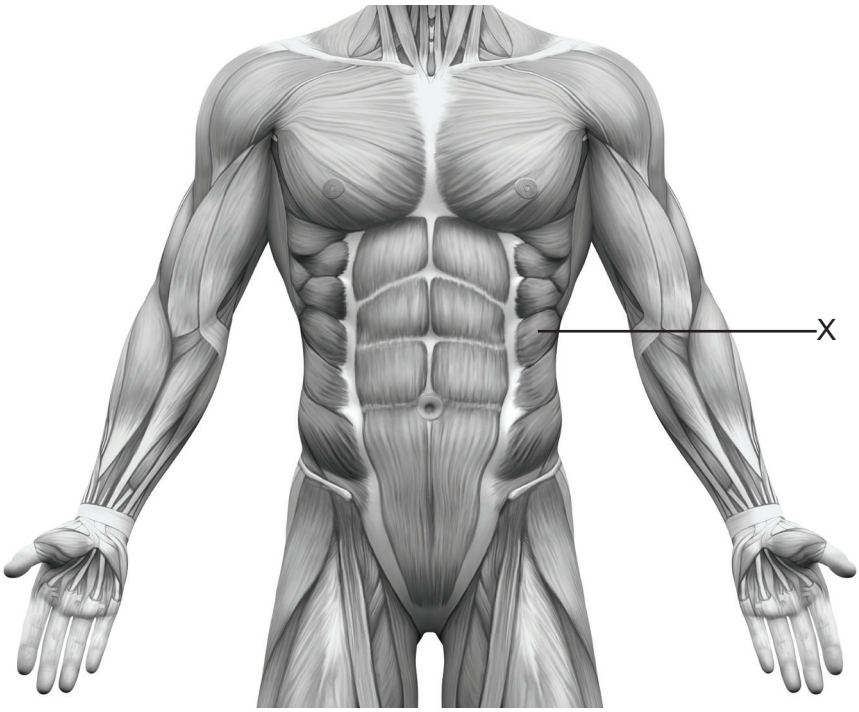
(b) Identify the muscle group X. [1]



X . . . . . .

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(Question 3 continued)

(c) Explain the role of ventilatory muscles during inspiration when running a 10 km race. [4]

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(d) Distinguish between the recommended carbohydrate intake of a trained 10 km runner and a sedentary individual. [1]

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(e) Insulin and exercise regulate muscle glucose levels. Explain the role of muscular contraction on muscle glucose uptake during a run. [4]

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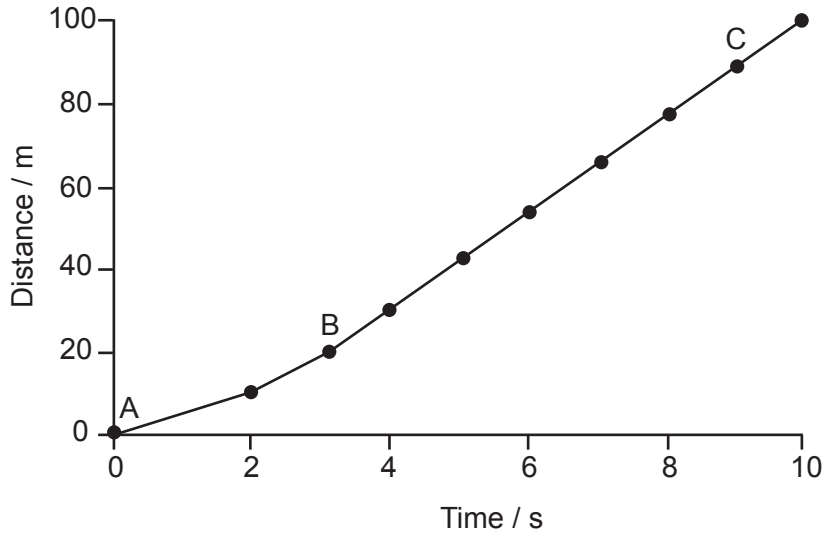
4. The diagram shows a distance–time graph for a 100 m sprinter.



(a) Analyse the graph between

(i) A–B. [1]

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(ii) B–C. [1]

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(b) Compare and contrast the feedback loops involved in motor programmes for a novice and an experienced gymnast. [3]

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(Question 4 continued)

(c) Outline how exercising outside can increase an athlete's vitamin D levels. [2]

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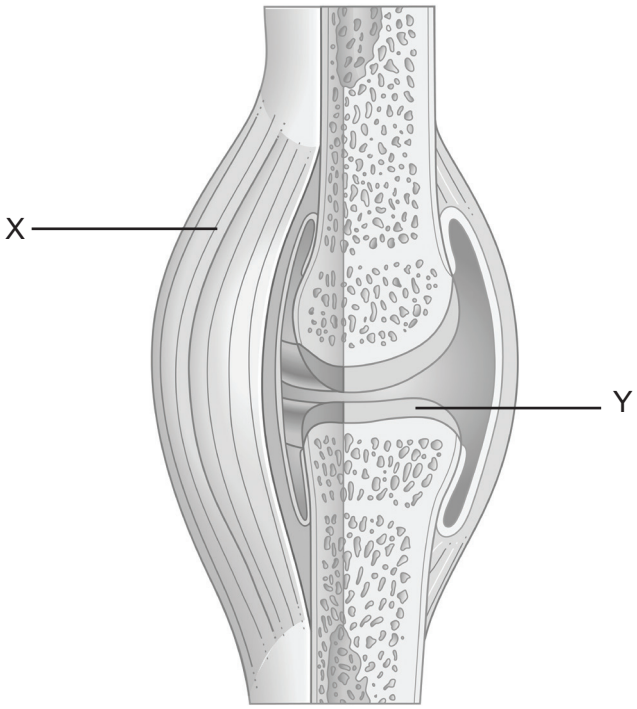
Answers written on this page
will not be marked.

5. The diagram shows a synovial joint.



(a) Annotate the structures X and Y in the synovial joint. [4]

	Structure	Annotation
X	. . . . .	. . . . .
	. . . . .	. . . . .
Y	. . . . .	. . . . .
	. . . . .	. . . . .

(b) Using named muscles, analyse how muscles work in pairs to coordinate knee extension when kicking a ball. [2]

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6. (a) Apply the following components of fitness to a sport of your choice:

(i) Flexibility [1]

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(ii) Speed [1]

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(iii) Muscular endurance [1]

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(b) Label the diagram to show the relevant forces acting on a person running at constant velocity. [4]

(This question continues on the following page)

(Question 6 continued)

(c) Suggest **three** performance and health benefits of genetic screening for athletes. [3]

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Section B

Answer **two** questions. Answers must be written within the answer boxes provided.

7. (a) Apply the phase analysis model to a penalty kick in soccer. [4]

(b) Discuss the contribution of environmental factors to the performance of an elite weightlifter. [4]

(c) Explain gaseous exchange at the alveoli in a cyclist competing in a road race. [6]

(d) Outline the pathway of a red blood cell once it is saturated with oxygen in the pulmonary capillary and arrives at the capillaries of the systemic system. [6]

8. (a) The brain predominantly receives energy through aerobic respiration. Describe the challenge of supplying energy to the brain cells. [3]

(b) During a period of recovery, the body repairs and builds tissues. Explain how the hypothalamus regulates the pituitary gland. [6]

(c) Explain how a rugby player can change the position of their centre of mass to increase their stability as they prepare to make a tackle. [5]

(d) An athlete runs a 400 metre race in 60 seconds. Describe the re-synthesis of ATP during this race. [6]

9. (a) Outline **four** strategies an athlete can adopt while training from home to minimize their risk of infection. [4]

(b) Using examples, suggest how a coach can use task and environmental constraints to introduce field hockey to young novice players. [5]

(c) The image shows a biathlete rifle shooting at a stationary target during a biathlon. A biathlon involves shooting at targets at multiple locations along a cross-country skiing course.

Apply the skill classification continuum to one rifle shot performed by a biathlete. [5]

(d) Evaluate the use of Cooper's 12-minute run test to assess the fitness of a soccer team. [6]

10. (a) Distinguish the function of the predominant muscle fibres in the quadriceps of an elite marathon runner and a 100 m sprinter. [5]

(b) Outline how surface and wave drag affect the performance of a swimmer and how they can be reduced. [4]

(c) Discuss the factors affecting fatigue during 100 m sprint training. [5]

(d) An athletics coach is teaching a group of novices how to perform long jump. Explain how the coach could present the skill using **two** different methods. [6]

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References:

3. Decade2d, n.d. [Redacted] *Muscles - Anatomy Muscles isolated on white - stock photo*. [image online] Available at: https://www.gettyimages.co.uk/ [Accessed 21 April 2023].

5. Kindersley, D., n.d. *Cross section biomedical illustration of synovial joint - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/cross-section-biomedical-illustration-of-royalty-free-illustration/150955126?adppopup=true [Accessed 21 April 2023].

6. Msan10, n.d., *Running men, set of vector silhouettes, group of people - stock illustration*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/running-men-set-of-vector-silhouettes-group-royalty-free-illustration/1300502602 [Accessed 21 April 2023].

9. Technotr, n.d. *Young women shooting during biathlon competition - stock photo*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/young-women-shooting-during-biathlon-competition-royalty-free-image/185090207?phrase=young+woman+shooting+during+biathlon&adppopup=true [Accessed 21 April 2023].